

a) a non-rotating cyclone eddy chamber having an inlet thereto and an outlet therefrom, said chamber being shaped for passing gas-containing blood in the form of a cyclone eddy current for producing a centrifugal force that separates the blood into a blood phase in a radially outer cyclone eddy region and a gas phase in a radially inner cyclone eddy current region;

b) the cyclone inlet comprising at least one helically circularly extending blood inlet channel, the blood inlet channel shaped for narrowing in funnel like manner, at least over part of [its] the cyclone inlet length in the direction of blood flow therealong in a helical circular path shaped for accelerating the flow of gas containing blood through the blood inlet channel;

(i) said blood inlet channel having an end section directed substantially tangentially into the cyclone eddy chamber spaced from the cyclone outlet;

(ii) said blood inlet channel being defined between a surrounding housing having an inner wall which defines an outer wall for the blood inlet channel and an insert body inserted in the surrounding housing and having an outer wall which defines an inner wall for the blood inlet channel, the housing inner wall and the insert outer wall being respectively shaped for defining a funnel shape of the blood inlet channel;

(iii) said insert body including at least one helically extending rib passing around the insert body; the rib, the outer wall of the insert body and the inner wall of the blood inlet channel of the housing defining a helically extending groove which defines the blood inlet channel;

(iv) said housing inner wall maintaining a substantially constant cross section and the diameter of the insert body at the base of the groove defined between the windings of the helical rib becomes conically enlarged from a minimum diameter upstream toward the inlet of the blood inlet channel to a maximum diameter toward the downstream end of the blood inlet channel toward the cyclone eddy chamber;

(v) the cyclone outlet from the cyclone eddy chamber and the blood phase being axially spaced from the cyclone inlet and said cyclone outlet for the blood phase has a center line which is aligned with the center line of the cyclone eddy chamber;

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(vi) the cyclone inlet and the cyclone outlet for the blood phase are arranged so that the cyclone eddy current rotates around as [it] the current moves through the cyclone eddy chamber, without reversal of [its] the direction of [directional] flow from the cyclone inlet to the cyclone outlet;

971 c) a gas outlet from the cyclone eddy chamber separated from and coaxial with the cyclone outlet for the blood phase for discharge of the gas phase from the cyclone eddy chamber; the gas outlet being downstream of the blood inlet channel and in [the radially inner] the interior portion at the center of the cyclone eddy current and the gas outlet extending in a direction which lies in the region between an axial forward direction and a tangential direction of movement of the cyclone eddy current;

d) an outlet channel downstream of the cyclone outlet for the blood phase, and the gas outlet being arranged in the outlet channel following the cyclone outlet.

19. (Amended) A device for removing gas from gas containing blood, the device comprising:

a) a non-rotating cyclone eddy chamber having a[n] cyclone inlet thereto and a[n] cyclone outlet therefrom, said chamber being shaped for passing gas-containing blood in the form of a cyclone eddy [current] flow for producing a centrifugal force that separates the blood into a blood phase in a radially outer cyclone eddy region and a gas phase in a radially inner cyclone eddy current region;

972 b) the cyclone inlet comprising at least one helically circularly extending blood inlet channel, the blood inlet channel shaped for narrowing in funnel like manner, at least over part of its length in the direction of blood flow therealong in a helical circular path shaped for accelerating the flow of gas containing blood through the blood inlet channel;

(i) said blood inlet channel having an end section directed substantially tangentially into the cyclone eddy chamber spaced from the cyclone outlet;

(ii) said blood inlet channel being defined between a surrounding housing having an inner wall which defines an outer wall for the blood inlet channel and an insert body inserted in the surrounding housing and having an outer wall which defines an inner wall for the blood inlet channel, the housing

inner wall and the insert outer wall being respectively shaped for defining a funnel shape of the blood inlet channel;

(iii) said insert body including at least one helically extending rib passing around the insert body; the rib, the outer wall of the insert body and the inner wall of the blood inlet channel of the housing defining a helically extending groove which defines the blood inlet channel, said pitch of said helically extending rib decreasing along the length of the rib in the direction of blood flow;

(iv) the cyclone outlet from the cyclone eddy chamber and the blood phase being axially spaced from the cyclone inlet and said cyclone outlet for the blood phase has a center line which is aligned with the center line of the cyclone eddy chamber;

(v) the cyclone inlet and the cyclone outlet for the blood phase are arranged so that the cyclone eddy current rotates around as it moves through the cyclone eddy chamber, without reversal of its directional flow from the cyclone inlet to the cyclone outlet;

b2 c) a gas outlet from the cyclone eddy chamber separated from and coaxial with the cyclone outlet for the blood phase for discharge of the gas phase from the cyclone eddy chamber; the gas outlet being downstream of the blood inlet channel and in [the radially inner] the interior portion at the center of the cyclone eddy current and the gas outlet extending in a direction which lies in the region between an axial forward direction and a tangential direction of movement of the cyclone eddy current;

d) an outlet channel downstream of the cyclone outlet for the blood phase, and the gas outlet being arranged in the outlet channel following the cyclone outlet.

20. (Amended) A device for removing gas from gas containing blood, the device comprising:

a non-rotating cyclone eddy chamber shaped for a passing gas containing blood in the form of a cyclone eddy current for producing a centrifugal force that separates the blood into a blood phase in the radially outer cyclone eddy region and a gas phase in [the radially inner] the interior portion of the cyclone eddy current region;

172 a cyclone inlet to the cyclone eddy chamber for gas containing blood; the cyclone inlet comprising at least one helically circularly extending blood inlet channel said blood inlet channel is defined between a surrounding housing having an inner wall which defines an outer wall for the blood inlet channel and an insert body inserted in the surrounding housing and having an outer wall which defines an inner wall for the blood inlet channel, the housing inner wall and the insert outer wall being respectively shaped for defining a narrowing funnel shape for said blood inlet channel, at least over part of its length in the direction of flow of blood therealong, in a helical circular path shaped for accelerating the flow of gas containing blood through the blood inlet channel; the blood inlet channel having an end section directed substantially tangentially into the cyclone eddy chamber spaced from the cyclone outlet;

said insert body the insert body includes at least one helically extending rib passing around the insert body; the rib, the outer wall of the insert body and the inner wall of the blood inlet channel of the housing defining a helically extending groove which defines the blood inlet channel;

a cyclone outlet from the cyclone eddy chamber and the blood phase axially spaced from the cyclone inlet;

the cyclone inlet and the cyclone outlet for the blood phase are arranged so that the cyclone eddy current rotates around as it moves through the cyclone eddy chamber; without reversal of its directional flow from the cyclone inlet to the cyclone outlet;

a gas outlet from the cyclone eddy chamber separated from the cyclone outlet for the blood phase for discharge of the gas phase from the cyclone eddy chamber; the gas outlet being downstream of the blood inlet channel and in [the radially inner] the interior portion at the center of the cyclone eddy current path, and the gas outlet extending in a direction which lies in the region between the axial forward direction and a tangential direction of movement of the cyclone eddy current.

21. (Amended) A device for removing gas from gas containing blood, the device comprising:

172 a non-rotating cyclone eddy chamber shaped for a passing gas containing blood in the form of a cyclone eddy current for producing a centrifugal force that separates the blood into a blood phase in the radially outer cyclone eddy region and a gas phase in [the radially inner] the interior portion of the cyclone eddy current region;

wherein said cyclone eddy chamber has a cross-section which narrows in funnel like manner in the direction of flow of the blood through the cyclone eddy chamber at least towards the downstream end section of the cyclone eddy chamber;

a cyclone inlet to the cyclone eddy chamber for gas containing blood; the cyclone inlet comprising at least one helically circularly extending blood inlet channel shaped for narrowing in funnel like manner, at least over part of its length in the direction of flow of blood therealong, in a helical circular path shaped for accelerating the flow of gas containing blood through the blood inlet channel; the blood inlet channel having an end section directed substantially tangentially into the cyclone eddy chamber spaced from the cyclone outlet;

a cyclone outlet from the cyclone eddy chamber and the blood phase axially spaced from the cyclone inlet;

the cyclone inlet and the cyclone outlet for the blood phase are arranged so that the cyclone eddy current rotates around as it moves through the cyclone eddy chamber; without reversal of its directional flow from the cyclone inlet to the cyclone outlet;

a gas outlet from the cyclone eddy chamber separated from the cyclone outlet for the blood phase for discharge of the gas phase from the cyclone eddy chamber; the gas outlet being downstream of the blood inlet channel and in [the radially inner] the interior portion at the center of the cyclone eddy current path, and the gas outlet extending in a direction which lies in the region between the axial forward direction and a tangential direction of movement of the cyclone eddy current.